PYRO»TECHNICS

The Now & Then Newsletter of
GENERAL TECHNICS

Created & Perpetrated by

JEFF & CAROL DUNTEMANN

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The Tech of Writing I

I've been asked innumerable times where I get my story ideas from, or how it is that I create the images and situations I do. My standard answer is a gentle shrug; I honestly don't know. Well, that's not entirely true. What I can't give you is the whole answer; being a writer is a condition suffused through the entire personality. But it may be time to jot down a few notes on the things I've noticed that help me along. I can't say whether following a do-it-yourself guide will ever make you a writer. Many writers insist that if you're not cut out to be a writer, you may as well forget it and go back to hanging wallpaper. This sounds needlessly cruel and Calvinistic, and I don't quite believe it. What they may be saying is that most people lack the determination and self-knowledge required to make the changes in themselves necessary to do effective writing, and that is probably the truest thing you could say about most would-be writers. Whatever else it is, writing well is hellishly hard work. Those who do it for a living are driven people, often madmen. Those who dabble in it seriously (as I do) often toss things at the wall and cuss it out for being an ungodly energy-sink and waste of time.

But we keep doing it for some reason. Maybe these notes will begin to shed some light on it.

There are preconditions to being as writer. The first and most important is this: Be Outrageous. Outrageous thoughts occur to outrageous people. Stay a little immature. Remember the skill of being silly. Don't be afraid to be thought a weirdo by the great unwashed masses of Invisible Citizens; instead, wear it like a badge of honor. Never consider anything "unthinkable"; anything you can think of is not only thinkable, but frequently marketable in the right wrapper. Famous writers have written stories of eating babies and aliens who communicate by shitting at each other. Thinking only "right thoughts" will turn you into an Invisible Citizen in no time flat. Real ideas come only from the outrageous, nonlinear, utterly uninhibited region of the mind we call the subconscious. Living outrageously will allow the subconscious to exist close to the surface, where you can develop the skill of grabbing off the ideas as they bubble, however briefly, up toward the surface and down again.

Also: Feel Deeply. Fan your fires until they burn hot. Care about what goes on about you and within you. Form opinions. There is a quality in writing called conviction; it means you honestly-to-godly believe in what you're saying. This often means developing acting skills. You may at times need to believe (for the sake of the work in progress) in something which you would not ordinarily care for. This is made a great deal easier by believing powerfully in the things you do cherish. When many critics say a story lacks feeling, they mean it lacks conviction; that the writer was just putting out words without his emotional shoulders behind them. There is some danger here; to avoid becoming a boor you have to excercise a certain amount of control. It's an art. But that doesn't make it unnecessary.

Given those preconditions, there are many things you can do to promote the healthy growth of ideas, outrageous or otherwise. One is to read voraciously. You can't be a writer if you are uncomfortable with the language, and the only way I ever found to be comfortable with the English language is to wallow in it up to your neck for extensive periods of time. Try to spread your interests around. In addition to my well-known preoccupations with computers and electronics, I also read histories of the Catholic Church, the ethology texts of Ardrey & others, books on dinosaurs, bridge building, and the evolution of sexual roles. Time spent reading is never wasted.

Listen to interesting people. I don't mean talk to them; keep yer trap shut and listen. Attend talks by experts in various things. Even listen to whackos now and then. Not only will it be an object lesson in avoiding the Stupidity Trap (I'm speaking of VonDanikenites and antinukers here) you never know when a valuable thought will slip out unnoticed, even by the whacko. When you hear a fascinating conversation going on at a con somewhere, resist the temptation to bust in. Let it go for awhile. A wildass discussion can become a live thing, greater than those it sprang from. It is also very fragile. Let it live for a time, and take notes.

Learn how to look at things. Too many of us keep simplified cardboard diagrams of the world's wonders at the backs of our minds. When a mountain heaves into view, out comes the cardboard mountain image; we say, "oh, yeah, a mountain, cool," and go back to staring at the insides of our heads with nothing going on. The hitch here is that when you want to include a mountain in a story, all you have to work from is the cardboard mountain image. Do any of you midwesterners really know what a mountain looks like? Next time you see one, think hard about how it's proportioned, what its colors really are, and what it suggests to you. The same goes for even everyday objects like oranges and ashtrays, desk lamps and extension cords. You may think you know what they look like. But you may also be assuming a helluva lot. Look again. You may lean something.

GENERAL TECHNICS

is an organization of fannish techies (and not techie fannies, as some wiseass reported) who pool information, resources, and experiences in pursuit of a good time and an occasional profit. The group meets mainly at cons, hamfests, and private Berserker Weekends.

BECOMING A MEMBER assumes you're willing to contribute to the group. This entails answering questions (at very least) by phone or SASE, concerning your own personal areas of expertise. So that people know what those areas are, you must submit a completed questionnaire and be listed in the General Technics Information Handbook. To obtain a questionnaire, send an SASE to:

Jeff Duntemann
301 Susquehanna Road
Rochester NY 14618

THAT DONE, return the questionnaire, a quantity of first-class stamps, and one American dollar bill. You will receive PyroTechnics until your stamps run out. You will know your brethren by the symbol they wear, and if you spot the symbol on a bicycle seat, well, then, sit on it!

This may be the time to mention a trick I picked up long ago: Search for images. Most of us don't see mountains very often. How to study one? Look through National Geographic, Geo, and Scientific American. Those magazines contain awesome photographs of things most of us never see at all, and things most of us, sadly, don't look very closely at. Images inspire ideas! A NG spread on Hawaii years ago showed a volcanic crater oozing lava with dark lumps of rock floating in it. Years after that, the concept of "Firejammer!" exploded in my head: Ships of stone sailing on an ocean of molten rock. There is another rather obscure magazine that many people overlook: Zoom. It frequently has nudes on the cover and I suppose people think it's a skin mag. It's not. It's the goldurndest collection of images you're likely to see. It's better, in a sense, than the scientific magazines, because its photographers are free to focus on the surreal and outrageous faces of our world. From Zoom I've garnered more alien landscapes and alien architecture than anywhere else. Pick it up. It's surprising as hell.

Study the works of other writers. See how they do things. This includes imitating them blatantly, if not for publication than for the lesson of putting on another writer's skin to see how it feels. I have hidden away some really rotten imitations of Barry Malzberg and Harlan Ellison--worthless except that they taught me that what works for other writers may not work for me. On the other hand, I have consciously imitated Theodore Sturgeon and made it work ("Marlowe") and Larry Niven more times than I care to admit. (This is not to suggest I'm as good as they are--I'm not--but that I have successfully used techniques they are famous for. Some things work, some don't. If you don't try 'em, you'll never know...)

Finally, write. Write. WRITE! Write lots. Practice counts here more even than in playing the piano. I wrote 80-some short stories before I ever sold one. I wrote a novel a year for three years, starting when I was fifteen. Yeah, most of that stuff is nasty wretched and dopey, but the sheer practice of grinding those several hundred thousand words out through my fingertips (destroyed two typehackers in the process) gave my writing a smoothness in execution of which I am very proud today. And that four foot thick of manuscripts is full of concepts which I can repolish and re-use, well, I will say this too: time spent writing is never wasted.

Nobody said it was easy. Nobody said it paid well. (I've just broken my second thousand dollars as a writer. Since the beginning. 'Bout ten cents an hour, I figure...) Nobody said there is a really good reason for doing it. I sometimes think that the only reason I write is that I have to; if I don't write for awhile, I get cranky and restless and unhappy. If you can carry it through to that point, then, by God, you will be a writer. You will never stop writing. That isn't to say that you will be a great writer, or even a published writer. But you will know the feeling of creation roaring out of your hands like a hurricane on fire, and that, as far as I'm concerned, is the next best thing to being God.

Next: Specifics

Rural Scrounge

Weiner J. Smith

Rural scrounge differs from urban scrounge in two important ways. Location is pretty self evident; urbans scroungers scrounge the urbans and rural scroungers scrounge the rurals. The second difference is in the things one actually scrounges out in the rurals.

Most of you are familiar with the artifacts of urban scrounge than I so I won't bother to tell you about all those wonderful Zeniths and Philco monstrosities that spilled their guts for you after you copped them from a curb. Although I have disemboweled more than my share of those beasties, my expertise is more in the rural angle and that's why Jeff asked me to write this. You may blame him. (No, blame Carol. I'm not NEARLY as good at persuading young men as she is... --Ed.)

Rural scrounge items tend to be less technical in nature. This is primarily because the things that happen out there in the boonies tend to be closer to nature, sometimes connected with crop development and animal husbandry. There are almost no known incidences of jet engine parts showing up on the curbs out here. In fact there are almost no known instances of curbs, either.

(Yeah, but don't look up now...a deacon at George Ewing's mother's church in St. Pete's Florida was seriously injured while riding his bike down a country road--by a one-ton bale of Columbian Gold falling out of the sky, jettisoned by smuggers from a DC-3 with a passel of Customs Authority planes behind it. Talk about scrounge... --Ed.)

The decline of the railroads notwithstanding, trainwrecks are among the more profitable events that occur in the land of the rural scrounger. Amtrak can still be relied on for a disaster every now and then which can keep a careful scrounger busy for a couple of days.

In the days of my ill-spent youth (egad, it's really over twenty years ago) an Erie-Lackawana freight dumped itself in the middle of my hamlet on a Sunday morning. Its single most significant load was five boxcars full of tunafish in seven-ounce cans. The insurance people told the railroad people they would pay the whole shot, but the railroad had to bury it so that the loss would be total. The rural scroungers followed the bulldozers, pickaxes and shopping bags in hand.

The toughest part about handling the tuna was that the railroad had used asphalt to bury the cans in, which left the cans in rather gummy condition. My father solved this by putting one-feed-bag loads of cans into the spin-tub of my mother's wringer washer. This seemed to take the grunge off real fine, and made it a great deal easier to pick out leaking cans. It killed the washing machine pretty much, but we had free tuna for a couple of years. I can evn remember packing the cans into boxes when we moved a while later.

A few years afterward another Erie-Lackawana train was generous enough to empty itself, also on a Sunday morning. (Right after the Saturday Night Track-Hacker Squad finished up, I suspect--Ed.) The major score on this one was a carload of almonds. Not as much was there as with the tuna and the police went nuts trying to keep people from walking off with the stuff, but the first few scroungers on the scene did all right for themsleves.

Most of you scroungers out there know all about the treasures which can be found along railroad tracks; toys like railroad ties and chunks of cast iron with ambiguous uses. I did think you might like to know that somewhere in the wilds of New York state a megatunafish sandwich waits under the asphalt for its time to come...

Next time I will tell you about the only World Class rural scrounger I ever knew and his forty acres of junk. And, maybe soon, I'll have a report on Happy Harold and his wood-fired pickup truck.

* * *

THE GREAT PYROTECHNICS TRIVIA QUIZ!

Test your skill! Do you know:

1) How many issues of #1 were printed, and what were they printed on?

2) Which issue was the infamous Green Issue, and why was it green?

3) Who was the wizard who first came up with right-justified columnar text for Pyro, and what the hell ever happened to him?

4) Who was the only human being ever to have his GT Biodata printed twice?

5) Who invented the Special Guest Star Issue?

6) Which issue was partly laid out by a Naked Woman? Who was the Naked Woman? (Don't be so sure...)

Author of the winning entry will take responsibility for filling odd-sized holes in all future issues of PyroTechnics...

Sharp Answers to Dumb Questions

Chuck Ott's article in the last issue really touched off some interest; I got Answers from quite a number of people. Y'know, they weren't really dumb questions at all; they were just things all of us take a little too much for granted. The world is full of such things, and it's too easy to buzz by them and never wonder what the hell is really going on. Do feel free to call such things to our attention, as Chuck did--maybe we'll all learn something in the process.

HERE'S THE WORLD FAMOUS ASTRONOMER TAKING A BREAK FROM HIS HECTIC SCHEDULE WHICH INCLUDES VERY IMPORTANT WORK AT THE JETPROPULSION LABORATORY....
...SPEECHES AT COLLEGES, APPEARANCES ON THE TONIGHT SHOW, MEETINGS WITH MY AGENT, WRITING MY FIRST NOVEL THAT I'VE ALREADY SOLD...
..MANY CELEBRITIES FIND THEIR PERSONALITIES CHANGE AS THEIR WORK CONSUMES MORE OF THEIR TIME AND THEIR SELF-IMAGE SHIFTS...
...I KNOW THAT I CAN HANDLE IT, THOUGH; FOR INSTANCE, I'M NOT THE LEAST BIT PARANOID ABOUT THOSE BILLIONS AND BILLIONS OF COSMIC DUST PARTICLES PILING UP IN MY SUPPER DISH...
JOE SCHULTZ

AND NOW, THE SHELL ANSWER MAN:

By Ed Hanley

Chuck Ott got me thinking in the last PYRO, and I'd like to offer the following in responses to his dumb and not-so-dumb questions:

WHERE DO RIVERS COME FROM?

They come out of the everloving sky, for crying out loud! And you got it right the first time, Pardner: Yes, the rainfall over the entire recharge area does indeed average out to a relatively constant flow. Keep a running account of the cloud cover that your friendly neighborhood weatherman shows you on the satellite "photos" every evening and you'll get an idea of this. And again you guessed it right, that some of the river water does come out of the ground. Not out of the soil so much, but out of the rocks themselves. Rocks are generally much more porous and permeable than most people think, and they make good buffers for water flow because the water seeps through them slowly but constantly, in tremendous volumes. Some of the rivers in Arkansas, for example, are recharged miles away in Missouri, where rain falls upon and into the St. Peter Sandstone and other permeable formations, which dip southward, under the hills, and are exposed again on the southern flanks of the Ozark uplift. So a river's recharge area need not be limited by topography, but could be much larger than it first appears. I won't go step by step through the hydrologic cycle with the numbers, porosity figures, and hydraulic formulas because I haven't time for the excercise right now, although it would be fun. Besides, I myself am a victim of the syndrome I'm about to discuss in a few paragraphs from now. But take my word for this: rivers don't flow on unceasingly like something out of Siddhartha. You guessed right on the correlary: if it don't rain, it won't flow. Go west, young man, and look at the Rio Grande, the Rio de Los Angeles, the Platte River, or heaven help us, the Colorado. Ask me at a con and I might tell you about Fuchichi, a rowdy but endearing Bolivian Indian I worked with who deserves more of a eulogy than I am able to give him. He's dead now, because of the response of the Tipuani River to the rainfall upstream. I had to watch from the hillside while that thunderstorm broke upriver, twenty miles away on the slopes of the Andes. The river depth went from two feet to eight feet in two minutes, and Fuchichi was in the middle. (Don't ask me about him if I'm drunk.)

WHY ARE THE VEINS IN MY WRIST BLUE?

Because your skin and veins are translucent and you can see the blueness of you blood through them. You guessed wrong on this one: Everybody does actually have blue blood. The claret hue assigned to this precious bodily fluid is due to the hemoglobin, which is blue until it osmotically absorbs oxygen from your pink little lungs and gets rusty. Next time the nurse lets your veins, ask her to extract the blood into a vacuum bag under completely anaerobic conditions. If she obliges you (she won't) you probably won't see red but more like dark blue or purple.

WHY AREN'T PEOPLE COVERED WITH HAIR?

Darn good question! Desmond Morris, in one of his more scientific moments made this same astute observation and wrote a book about it, called *The Hairless Ape*. Unfortunately the bulk of the empirical observation in his book was embodied in the title. And he never got around to explaining WHY we don't grow our own fur. Somehow I never felt that not getting an explanation from Desmond Morris was any great loss. Now, if I tried long enough I could dredge up from the dross of my memory the name of the woperson who wrote *The Descent of Woman*. But it's not worth the effort. Anyway, she maintains that we haven't any hair because we lost it when we reverted to living in the ocean. But she can't cite any archeological evidence of our shoreline based culture because it all washed out to sea. Get it? Q.E.D.!

So I can't answer your question, but keep asking it. It might fall on the ears of an intelligent ethologist with the time and resources to do the proper research.

I will pass along this suggestion, however: natural selection is neat, but it ain't perfect. There are a lot of traits that get passed along which may have no survival value whatsoever, but just go along for the ride. Traits can be classified as pro-survival, anti-survival, and "don't care". Hair may have become a "don't care" trait when we became intelligent enough to wrap skins about our bodies for extra warmth. From that point, whether we had it or not simply became a matter of the way the genetic dice fell. For what it's worth, someone said we happen to have the same number of follicles as a gorilla but grow thinner, shorter hairs. I don't question that guy's findings, only his method: how did he get the gorilla to stand still long enough to count?

Hey, wait a minute. Before I go on here, I'd like to indulge in a primal scream of outraged indignation: WE DID NOT EVOLVE FROM APES! What are you, some kind of religious fanatic?! We diverged from those critters back in the Eocene, long before they themselves evolved; our common ancestor as far as anyone can determine is a lemur-like primate about the size of a baseball glove. Let's not have any more of this "man evolved from monkeys" bullshit!

There, that feels better. Now let me explain that outburst. It's not really directed at you, Chuck; it's just that I'm writing this in a motel room in Little Rock, and last week the Arkansas legislature passed a law requiring that "Scientific Creationism" be giving equal time in public schools with the teaching of the theory of evolution! They scraped raw a nerve of this geologist who's worked with fossils in the Bible Belt, where people don't really read their Bibles, but derive their religious convictions from "The 700 Club" on TV. I think that fans, because of their willingness to think while they read, would be able to get more out of the Bible than some fundamentalists could. With or without Asimov's excellent commentaries. Either way, it's a book I'd heartily recommend to anyone, especially in the Knox translation, which is highly readable and entertaining, particularly in some places where the King James version is totally undecipherable.

WHY IS THE INSIDE OF A REFRIGERATOR COLD?

Well, you got it right down to "why does gas cool when it expands?" and I gotta admit I don't know! That is, I know vaguely that it has to do with total energy content of the gas per unit volume and the reduced number of collisions, but I can't explain it concisely. So what good does that knowledge do anyone except to sit in my fuzzy little brain? I could look it up right quick, but that's not the point; the point comes down to your last question, and the reason we are all techies to some degree or another:

Yes, I dare say we ARE all losing our education, at a rate that is proportional to our inattention to and disuse of all those little facts and principles we so joyously learned back in those Golden Years. Let's face it, when we stop using our minds they just sit and rot. But the rot sets in slowly, insiduously; and fortunately, it's reversible. But wait a minute. I'm using the wrong metaphor, because thinking isn't a purely physiological process. (And if any of you Rational Materialists, want to take exception to that, I'll take you all on with one astral arm tied behind my back!) Let's try it this way: the disuse of our minds is analagous to, and insofar as it is physiologically dependent, directly linked with the physical disuse of our somas. When we stop putting vigor into our movements our bodies become flabby; when we stop pushing with our curiosity and lose the habit of focusing our minds, we get flabby souls. And we lose the strength to carry in our accessible memory all those facts and logical algorithms once so meticulously worked out, and they sink into the subduction zones of our unconscious.

Now, there's no way we can use all that stuff we learned during those many years of schooling over and over every day, to keep the algorithms warm and the facts at our fingertips. Most of us have to specialize at something in order to fit into an economic niche, and therein lies the focus of our productivity. But for some of us that ain't nearly enough (praise Allah!) because we've fallen in love with solving problems, or we're intoxicated with the power of technology, or we like to watch blinkies go. So we pick some of our creative skills and sharpen them on the whetstone of technology. Techiedom is born! But lets face it, gang. We can't all be Asimovs. Not right away. To know everything in the universe takes work, the effort of concentration, and time. Lifetimes, probably. But keep the faith; we'll get there eventually.

CURIOSITY ANSWERED BY THE KAT

By Sherry Katz

First of all, there is no such thing as a dumb question. Just because you might not know the answer to something doesn't mean the question is dumb. A lot of answers seem like they should be obvious but aren't.

Actually, we haven't lost out coat of hair, It is still there, though it is now made up of fine hairs less densely arranged. Humans have fewer hairs per follicle than animals with "more" hair or fur. In facty, we have more hair than chimpanzees do! Their hair is just thicker, coarser, and denser. Chimpanzees are actually born with no body hair. Only the hair on their heads is present. Human fetuses have grown a fine hairy down which covers it entirely by the sixth or eighth month of gestation. It is called the lanugo and is lost soon before birth. Premature babies are often born before it is lost but it does disappear soon after.

Although our thin hair is of little use in keeping us warm, it has retained residual function. Our hairs still rise in response to cold and emotion, causing the pricking sensation and "goosebumps" we are so familiar with.

The "how" of our seeming nakedness is best explained by neoteny. The fetus passes through many stages and exhibits a wide variety of features that seem to recall our non-human and non-mammalian ancestry and relatives. As to why humans "lost" their hair, no one really knows for sure. (See excellent comments by Bob Hughes, below--Ed.) The best explanation seems to be the combination of reduced hair, more sweat glands, and the thick layer of fat under the skin (which other primates lack) conferred a distinct temperature regulating advantage when we left the forests for the hot, unshaded open plains and switched careers from gatherer to hunter. The change to hunter is one of the most significant events in our evolution. Other explanations which have a minor role are sexual and social signals (like the bare rumps of other primates), helping to get rid of skin parasites that prosper in the fixed home bases our ancestors switched to, an aid to cleanliness to counteract messy feeding habits (which is why vultures lost their head feathers), the invention of clothing and the discovery of fire making hair unnecessary, and greater sensitization ot erotic stimuli. There is even a theory that we once poassed through an aquatic phase.. Humans are rather unique and the road of our evolution is paved with many innovations and adaptations. It is likely that we didn't lose our dense hair until after we left the forests and went through changes that simply made it unnecessary. For more information, I refer you to *The Naked ASpe* by Desmond Morris.

Our veins look blue die to a combination of factors. The walls are thin which allows the blood to be sneen (arteries have thicker walls and are located deeper under the skin). The dark red veinous blood actually has a purplish tinge to it. When viewed through the skin the blood simply takes on a blue color due to the interaction of these factors. It may even be that skin filters out the longer wavelengths of light just like water does (that is why uinderwater scenes are green and blue). You may have noticed that capillaries, whic are also thin-walled and near the surface, also appear blue. The ones which are very near the surface look more red. Veins which are deep or covered by very thick skin do not appear blue when viewed from the "outside."

I hope this satisfactorily answers these two questions. As to the other two, I bow to the geologists and physicists among you. (And Ed Hanley, our resident geologist, bows back. --Ed.)

HAIRY THOUGHTS

By Bob Hughes

First of all, Chuck, you suffer from temperate zone prejudice. Homo Sapiens are descendednts of Australopithecus Africanus (southern ape from Africa). The loss of our primeval hairiness must be understood in terms of the environment in which it evolved.

Despite your doubts, the cause of Homo's lack of hair *is* the need to avoid overheating. The reaosn cats have survived this long with hair is that they tend to be nocturnal. Humans are diurnal.

Homo has the same number of hair follicles as the Great Apes: the difference is that the majority of these hairs grow very little.

However, Homo has a much larger number of eccrine (sweat) glands than the Apes. These glands are also much more active. These two to five million sweat glands play a very active role in maintaining body temperature. This strictly maintained body temperature is essential to the proper functioning of the human brain. Metabolic heat is not generated in the brain and scalp. Therefore hair is there to protect the brain from overheating and to provide some natural cushioning against blows to the skull. Even today baldness is mostly a temperate zone phenomenon. The other major concentrations of human hair coincide with concentrations of apocrine glands. These scent-producing glands produce the sexually stimulating odors that most of us try to cover up with perfume and deodorant.

In short, the loss of human hair coincided with the emergence of humans from the forest into the grasslands, probably due to a change in the world's climate which made the forests shrink. List Australopithecus found the best way to survive was to hunt while everybody else was asleep. (In the noonday sun, just like mad dogs and Englishmen). In order to be able to do this without keeling over from heat prostration he had to shed most of his hair. He also had to learn to stand up so that he could see over the tall grass and run long distances while carrying things.

The functions of facial hair are not greatly undrstood. However if one is standing in the grass all the time, it is probably wise to put all the dientifying characteristics on the face and make them clear and variable enough so that long distance identification can take place easily. For more information try *Scientific American* #212, PP. 56-66, 1965.

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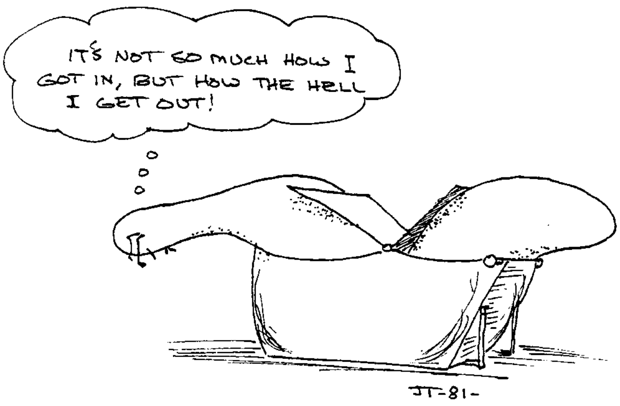

IT'S NOT SO MUCH HOW I GOT IN, BUT HOW THE HELL I GET OUT!
JT-81-

CAPN AL

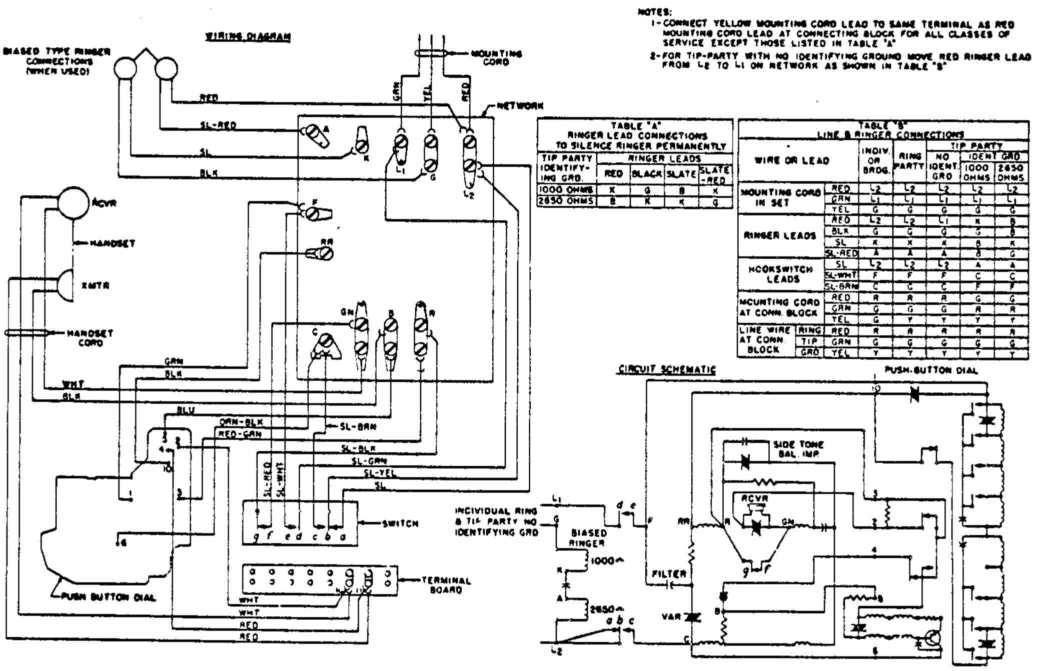
Phonehacking

It took me until age 25 to rid myself of the abject fear of fooling around with the telephone system. Ma Bell shares similar lockers in the rumor mill with the FCC--she'll crunch ya if ya step out of line. Depends, depends... As with the FCC, the big Mother is unlikely to notice you at all unless you do something really nasty or very expensive. Sending a kilovolt down the phone line for kicks might be an example of the former; blueboxing is an excellent example of the latter. The "right" of Bell to collect rent on every telephone in use is questionable indeed; as long as I pay for the monthly connect and units used, I have no qualms about arranging my own equipment my own way.

The phone system is amazingly rugged. You *can't* damage either the phone or the system by hooking it up wrong. It may well not work, but it won't fry anything. Indeed, the infamous Randy Seuss told me, quite simply, to connect the four phone wires to the four outlet screws in various combinations until I got a dialtone. It's that simple.

Actually, it's simpler. Most phones are two-wire devices, and the significant wires are red and green. Where a yellow wire exists, tie it to the green wire unless you're on a party line of some sort. (And if you are, get off of it, for god's sake!) The yellow wire carries the ringing voltage, so if you let it hang loose, the phone won't ring. However, in most urban phone systems the ringing voltage goes down the green line, and you must physically remove a wire from the ringer coils to prevent ringing.

Furthermore, dial phones are unpolarized, so it doesn't matter which way you connect the red and green telephone wires to the two signal wires coming in from the pole. For touchtone phones



NOTES:
1- CONNECT YELLOW MOUNTING CORD LEAD TO SAME TERMINAL AS RED MOUNTING CORD LEAD AT CONNECTING BLOCK FOR ALL CLASSES OF SERVICE EXCEPT THOSE LISTED IN TABLE "A"
2- FOR TIP-PARTY WITH NO IDENTIFYING GROUND MOVE RED RINGER LEAD FROM L2 TO L1 ON NETWORK AS SHOWN IN TABLE "B"

TABLE "A"
RINGER LEAD CONNECTIONS
TO SILENCE RINGER PERMANENTLY

TIP PARTY IDENTIFYING GRD.	RINGER LEADS			
	RED	BLACK	SLATE	SLATE-RED
1000 OHMS	K	G	B	K
2650 OHMS	B	K	K	G

TABLE "B"
LINE & RINGER CONNECTIONS

WIRE OR LEAD			INDIV. OR BRDG.	RING PARTY	TIP PARTY		
					NO IDENT. GRD	IDENT GRD	
						1000 OHMS	2650 OHMS
MOUNTING CORD IN SET		RED	L2	L2	L2	L2	L2
		GRN	L1	L1	L1	L1	L1
		YEL	G	G	G	G	G
RINGER LEADS		RED	L2	L2	L1	K	B
		BLK	G	G	G	G	B
		SL	K	K	K	B	K
		SL-RED	A	A	A	B	G
HOOKSWITCH LEADS		SL	L2	L2	L2	A	A
		SL-WHT	F	F	F	C	C
		SL-BRN	C	C	C	F	F
MOUNTING CORD AT CONN. BLOCK		RED	R	R	R	G	G
		GRN	G	G	G	R	R
		YEL	G	Y	Y	Y	Y
LINE WIRE AT CONN. BLOCK	RING	RED	R	R	R	R	R
	TIP	GRN	G	G	G	G	G
	GRD	YEL	Y	Y	Y	Y	Y

this is not true; if you connect them backwards you will get a dial tone but the touchtone pad will not work. If you connect a TT phone and that is the case, simply reverse the connections at the wall.

Radio Shack sells lots of phone hardware these days. My suggestion is to use what they call a "modular" plug for all phone connections. It's a little plastic brick that's crimped onto the end of a phone wire, and uses the wire's four copper conductors as the "prongs" of the plug. You can buy ready-made cords with modular plugs on them (the tiny clear plastic kind are miniscule but real tough to add to a wire yourself) or you can buy a slightly larger modular adapter which has four screw terminals for attaching wires with large, clumsy fingers. Using your own wire can save you a bundle; ready-made modular cords cost eight or nine bucks at the Shack, while the adapters run $2.25. The modular adapters have color coded spade lugs under the little cover plate; simply hook red to red and green to green and let the others hang. (Unless, as above, you're on a party line...)

So much for installing an "unofficial" phone. The real neat stuff is inside, and it's easier to understand than you might think. No matter who makes the phone (ITT, Western Electric, Northern Telecom, Stromberg-Carlson are some I've seen) all internal connections go to a number of terminal points with standardized names. These points are usually gathered together on a labeled bakelite terminal board. On some phones the board is mounted atop a plastic block which contains a number of resistors, caps, and coils. On other phones the terminal points are an integral part of the plastic block. I have yet to see a phone on which the points were not labeled. The names are one or two letter combinations like "L1", "L2", "GN", "F", "C", and "RR".

The diagram above shows both physical wire runs and electrical connections for an ITT Touchtone desk phone. Generally, the colors on the wires are standard across all manufacturers. With this diagram you should be able to disconnect ringers, replace handsets, or replace Touchtone pads.

To disconnect a ringer, lift the slate/red wire from point "A" and tape it off. It's that easy.

Replacing a handset is almost as easy. Two white wires come from the receiver. They are not polarized, and are interchangeable. The receiver, by the way, is a neat little high-impedence dynamic speaker which can be used as a terminal beeper or other noisemaker when you want enough volume to be heard but not enough to be irritating. They can often be bought at hamfests for a quarter or two. Ditto the mike button, which is a carbon unit, extremely sensitive, and virtually indestructable. The mike button's leads are polarized for some reason, so get them right. On many phones the little barrier strip marked "terminal board" on the diagram does not exist. (When it does exist, it sits directly beneath the touchtone pad.) As only two points are used, some manufacturers no longer include it. In those cases, the manufacturer usually provides two extra terminal points on the main terminal board. These are often labeled "E1" and "E2", for "extra", I imagine. If you can't find such extra terminal points, clamp the spade lugs which require connection together with a 4-40 screw and tape the joint. Crass, but it works.

Replacing a Touchtone pad is scary due to the number of wires involved, and sometimes it can be a hassle getting the little spade lugs pushed down into insertion-type terminal points. Use a needle-nose pliers and check every color code and terminal point name twice. If, when you get the pad connected, the phone works weirdly or not at all, doublecheck your connections.

Western Electric Touchtone pads (common in the Chicago area, less so out here) complicate the matter by having five or six extra wires which are not mentioned in the ITT circuit diagram. These wires go to additional switches inside the pad, and lord knows just what they're for. Only one is important. If you connect a Western pad, your ears will get blasted by all the clicking and clunking while you dial unless you connect the white/blue pad lead to terminal point "R". This connects a resistor across the receiver while the switching transients are passing through and mutes them. On other pads this function is switched internally without outside connection. The other wires serve no purpose on desk phones (they may be used on multiline phones; I'm not sure) so tape any loose ends off to keep them out of mischief.

With this information you should be able to do what I recently did (only more quickly): I bought a number of loose phone parts at the Rochester hamfest, including a handset, cord, phone body, and TT pad, and hooked them up into a new-looking TT desk phone for $15. You could do better; I paid $6.50 for a brand new handset because I wanted everything to be the same color. If you don't mind multicolored Frankenstein Phones, you could well put a phone together for ten bucks or less.

Aside from being cheap at hamfests, there is very little excuse for dial phones these days. Except--they are very easy for a computer to emulate. Rotary dials do their thing by tripping a contact between points "RR" and "F". This contact is normally open; closing it momentarily pulls the voltage on the phone line down, creating a pulse for the phone company's switching gear to count. (Note that you have to pick the phone up first for this to happen--if you don't want to hold the phone while your computer dials, another relay must be arranged to bring the phone "off-hook.") The allowable pulse rate is between ten and twenty pulses per second. Duty cycle is about 40% closed, 60% open.

At the recent hamfest I also saw a little PC board to fit inside a phone which replaces the mechanical ringer with a rather shrill electronic chortle--Mike Bentley described it as "a cricket on uppers." With this installed and the ringer disconnected, your phone presents an open circuit to the line until you pick up the receiver. When the ringing voltage (90VAC at 20 HZ) appears on the line, a FET sampler triggers the chirper, and you can have a "ringing" phone without leaving your ass hanging out for Ma Bell to kick. Good idea. Shame the guy wouldn't sell me the circuit diagram, but it shouldn't be hard to dope out.

(How bout it? Somebody gonna design us a Phone Invisiblizer? C'mon, I toss out the glove...)

* * *

...I THINK I JUST RIPPED MY PANTS!
Disco Wookiee
JT '80

Quarks

Everybody gets restless on or about May 1, so it seems--so much so in Chicago that you can't hardly move in Rogers Park for all the vans and trailers blocking the side streets. GT isn't immune--we have recently had COA's from Sherry Katz, Ed Hanley, Karen Chapdelaine & Bob Hughes, Jamie Hanrahan, Michelle Fisher (nee Colsher), Mike Bentley & Alice Insley, Chris Cloutier & Cecile Thayer Cloutier, and Roxanne Meida. Others as well that I don't recall offhand; but it seems like every batch of mail brings in another new COA. I would have included a Mob listing this issue, but the List function on Phonedex (my mailing list program) does not yet work. The Mob is, however, safe on Ariel disk, and Phonedex at last provided the mailing labels for this whole issue. Ultimately, you'll be able to do your own COAs directly to Ariel hard disk from any computer terminal, but that requires that I get a hard disk, controller, and supply Ariel with his own phone line. Time & money, I guess...

Weddings, too: Chris and Cecile are tying the knot later in July, as are Chip Morningstar and Janice Johnson in mid-June. Jamie and Gail Hanrahan have been contractually connected for about a month now. Our best to them; marriage is a tough job but a good one: Long hours, low pay, but excellent fringe benefits.

Our thanks to everyone who has sent 18's and 3's the last few weeks. I am hoping to keep Pyros coming at five or six a year if possible, and this will require that they be a little leaner; the original 10 page standard will become a little commoner. In addition, we will be re-issuing the Information Handbook, with a little luck by telephone data transfer from Jamie's machine to Ariel, as Jamie has changed jobs and no longer has access to a good crisp letter quality printhacker. Look for it toward early July, certainly by the Rochester Berserker July 17-19. Uncle Willy's Wood Heat Handbook will be sent out to interested parties when it gets finished; it is now mostly a matter of layout and runoff. Look for it this fall. In addition, a number of regional groups are again toying with special guest Pyros, and these could appear at any time.

Ariel will become a 16 bit machine a little later this summer when I bring up the Godbout dual-processor (8085/8088) CPU board under CP/M-86. The decision to go 16 bit was based almost entirely on the fact that 64K X 1 RAM chips are now down to $34.95 each (Jade) and falling fast. 64K will soon be trivial, and with the advent of ADA and Path PASCAL (both state of the art memory-hog languages) 256K or better will become utterly de rigeur.

Again, I should mention the Cuyahoga County Robot Run, Oct. 24-25 around Hanna Fountains in Cleveland Ohio. Robots will be competing in a race that requires some smarts: Tear metallic ass around the Hanna Fountains and grab (somehow) a newspaper from a newstand, then return to the starting point, all without remote control. All systems must be programmable by a 14 year old person.

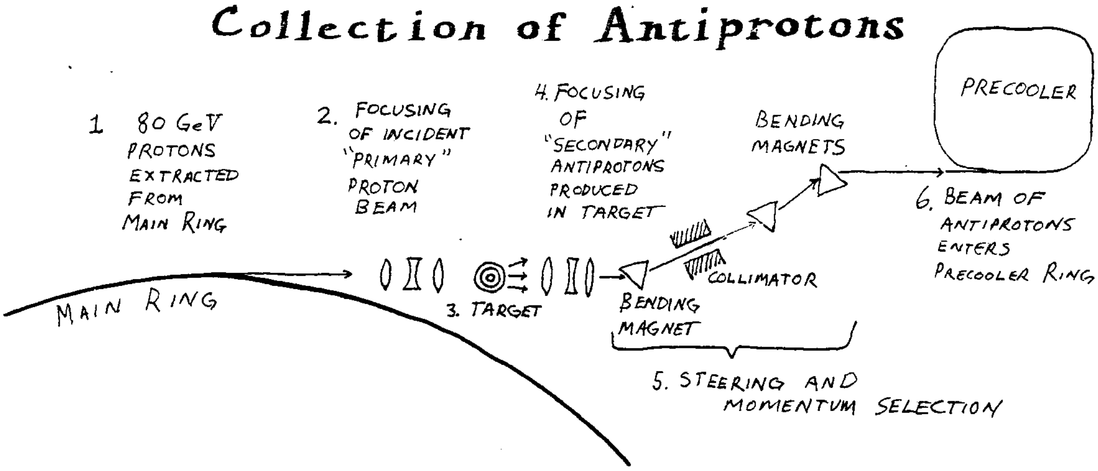
HOWEVER, it's a great idea and I'm glad somebody's putting it on, even though Cosmo will not be competing. Cosmo is undergoing the slow and painful transition from remotely-piloted box to largely independent robot, and that could take a few more (!) years yet. For more information on the Run, write:

CUYAHOGA COUNTY ROBOT RUN
7 C's Computer Center
3100 Chester Avenue
Cleveland OH 44114

ODD NOTES: It is now possible to buy a Smalltalk machine from the source, but don't get too excited: Smalltalk will be available for the new Xerox 8010 STAR Executive Workstation. Get yours today for only (gork) $16,500.

Xerox IS about to sell a high-end personal computer: The 820 SAM. (Also know as the Worm.) With a 4Mhz Z80, twin 8" disks, 64K, Wordstar, CP/M, and a daisy RO printer, the package comes to $5500. Inside the 820 is a Ferguson Big Board--check the Digital Research Computers ads in Kilobaud for a look at the Big Board. The 820 will be sold through computer stores just like any other similarly-priced machine. We'll see. (The Worm nickname comes from the 820's target market: Disappointed Apple III customers. The Apple III is turning into the biggest, most expensive computer flop in the micro industry's history. I use one at work now, and Lordy, what a honker...)

Figure 1: Production and Collection of Antiprotons


1 80 GeV PROTONS EXTRACTED FROM MAIN RING
2. FOCUSING OF INCIDENT "PRIMARY" PROTON BEAM
4. FOCUSING OF "SECONDARY" ANTIPROTONS PRODUCED IN TARGET
BENDING MAGNETS
PRECOOLER
6. BEAM OF ANTIPROTONS ENTERS PRECOOLER RING
COLLIMATOR
MAIN RING
3. TARGET
BENDING MAGNET
5. STEERING AND MOMENTUM SELECTION

Everything but the Kitchen Synchrotron

by Bill Higgins

Within the next few years, Fermilab physicists expect to manufacture more antimatter than anybody has before; to store it for periods of hours or days; to speed it up in the world's most energetic accelerator; and to observe it as it collides with a stream of normal matter, hoping to observe previously unknown phenomena. An ambitious program.

But our European competitors will be a year or two ahead of us...

I'm talking about two projects to experiment with the antiproton, the negatively charged twin to the proton we know and love, with a mass of .938 GeV/c\$^2$. It is usually denoted by p, the symbol for the proton, with a bar over it: $\bar{p}$. I will refer to it as "pbar," pronounced "pee-bar," because it's easier to type.

I'll discuss the Fermilab version of the pbar factory, since I am more familiar with its details. In Switzerland, however, the CERN consortium of European countries is further along with its project. It will be on the air a year or two from now, and has a good chance of beating us to some vital discoveries. But our machine, though later, will have twice the energy.

And the Lord Said: Let There Be Antiprotons

Antiprotons can be made in the same fashion as any other exotic particle, by smacking a suitably energetic beam of protons (or other common projectiles) into a target. The yield of antiprotons of a particular momentum increases with the number and energy of protons in the "primary" beam, but does not depend heavily on the material of the target.

In the Tevatron scheme, two trillion protons will be accelerated to 80 GeV in the good old Main Ring-- the conventional four-mile synchrotron which has been operating here since 1971. They will be piled into a single bunch about fifty meters long, extracted from the ring, and aimed at the target (Figure 1). Since each proton will carry about eighty times its rest mass in kinetic energy, its collision with a nucleus of a target atom will wreak untold havoc on the subnuclear scale. Out of this chaos will come many types of particles, with a wide range of momenta, leaving the target at a variety of angles. About eight million of these will be antiprotons traveling nearly at 1.4 degrees away from the direction of the primary beam, with a momentum near 4.5 GeV/c. These are the ones which will be collected for further use. Other secondary particles emerging from the target will be absorbed in shielding.

The fortunate few antiprotons head down a pipe downstream of the target, passing through magnetic fields which focus and steer them into the next stage of production. A large synchrotron such as the Tevatron or the Main Ring can only accelerate particles which are all moving at the same momentum, in the same direction. (Usually they are fed to the machine by a smaller accelerator which imposes this order.) If you were to ride on one of the protons in these machines, the other particles in the bunch would look as if they were standing still, or at least moving very slowly relative to your proton. In fact, your group of protons would resemble a gas at low temperature. All particles would be moving lazily, from your point of view-- even though an observer standing on the floor of the accelerator would swear that the whole lot of them was rushing madly past at the speed of light.

Well, the antiprotons we have just manufactured are not nearly so well behaved. Sit on one of these and look around you. Because of their chaotic origin, there is a wide spread in their momentum, and so they are moving in many directions, often at high speeds, around your pbar. You seem to be at the center of a hot gas of antiprotons.

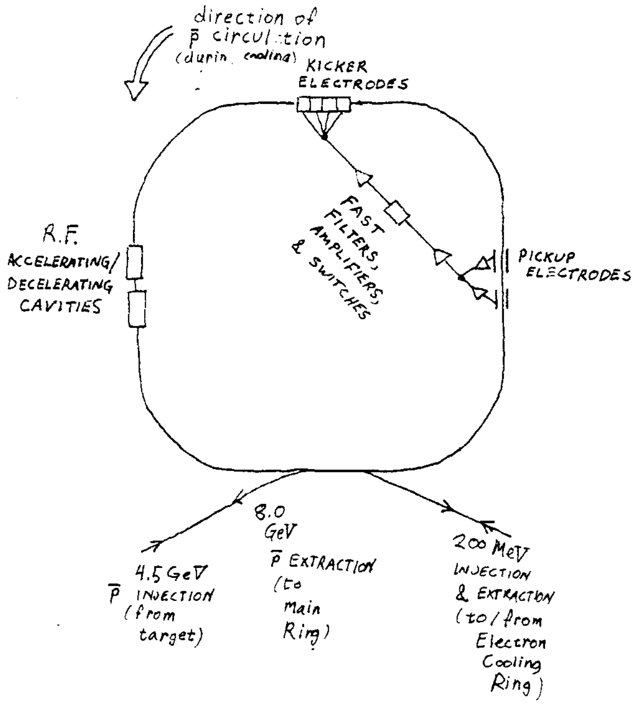
Some means must be found to persuade this crowd of rugged individualists to fall into step, to travel down the beam lines in a quiet and orderly fashion all at the same speed. In physical terms, the temperature of the batch of antiprotons must be reduced. Otherwise, an attempt to inject them into the Main Ring or the Tevatron ring would be a fiasco. Most of the pbars would not satisfy the rigid momentum demands and narrow apertures of the ring, and would plow into the walls. Two methods of "beam cooling" have been explored, and both will be used at Fermilab.

Stochastic Cooling: Heading 'Em off at the Pass

After being collected from the target, the pbars are steered into the Precooler, a small accelerator ring with comfortably large apertures and easy momentum requirements. As they circulate, still at 4.5 GeV, they pass a set of electrodes mounted on the sides of the beam pipe. The induced charge on the electrodes gives information about the position of the ragged cloud of antiprotons in the pipe.

Precooler Ring

Figure 2



This signal tells how far the center of the cloud is from the centerline of the pipe.

The idea of "stochastic cooling" is to nudge the beam back toward the center line, using this signal from the electrodes. If the beam is too far to the left, push it toward the right. If it is too high, push it lower. This will, on the average, tend to move the pbars toward the center of the pipe to stay, removing the randomness from their motion.

Unfortunately, the applied push only depends on the average position of the beam. There will be many pbars for whom the kick will be in exactly the wrong direction, and they will be sent further astray. But it has been shown that most of the particles survive, and that they do settle down to a more orderly state of motion.

The nudge is given by "kicker" electrodes some distance around the ring from the pickup electrodes (Figure 2). Since the pbars are moving at better than 99% of lightspeed, the signal from the pickups doesn't have much time to tell the kickers what to do. But the particles must travel around the circumference of the ring, while the signal can take a shortcut across the ring. Fast cables and electronics with a very short response time manage to get the necessary impulse to the kickers just as the antiprotons appear in the tunnel.

The pbars get a kick each time they make a ciruit of the Precooler. Eventually they have settled down from their unruly state enough so that decelerating them is feasible. The radio-frequency cavities are turned on, and oscillating electric fields slow the beam down a little on each pass, until its momentum reaches 2.6 Gev. Then the stochastic cooling process begins again. These steps are repeated until the beam is slowed to 200 million electron volts, and stochastic cooling is no longer practical. Now, six seconds after it entered, the beam leaves the Precooler and enters the Electron Cooling Ring.

Cool, Clear Electrons

The Electron Cooling Ring (Figure 3) is an oval accelerator. Attached to one of its long straight sections is an electron gun, big brother to the one in your TV set. It fires a pulse of electrons, and a series of magnets allows only those electrons in a very narrow momentum bite to enter the ring.

The trick is, first, to inject these very "cold" electrons just as the antiprotons are about to pass by, and second, to ensure that they are moving at the same speed as the pbars. Then both types of particles will move down the straight section together, elbow-to-elbow.

Imagine the scene once again from an antiproton's point of view. Suddenly it is surrounded, not only by a "hot" gas of other antiprotons-- which are still moving vigorously in all directions-- but also by a cloud of almost motionless electrons. Yet both kinds of particles are negatively charged. Each one will feel repulsive forces exerted by all the others. This will tend to start the electrons moving, and to slow down the average motion of the pbars. By the end of the straight section, the cold gas and the hot gas have mixed to become a single gas of intermediate temperature.

To get rid of the now-warm electrons, a relatively weak magnet is placed just before the end of the straightaway. It is strong enough to sweep the electrons right out of the beam pipe; the pbars, being 1800 times more massive, hardly notice its effect. Any perturbation it puts on their orbits is corrected by another, reversed, magnet of identical size after the electrons have vanished. Somewhat cooler now, the pbars continue around the ring to a rendezvous with a new group of electrons. They will go through this process again and again, until at last they are a group of civilized, well-behaved particles, acceptable to even the most genteel big synchrotron.

Electron Cooling Ring

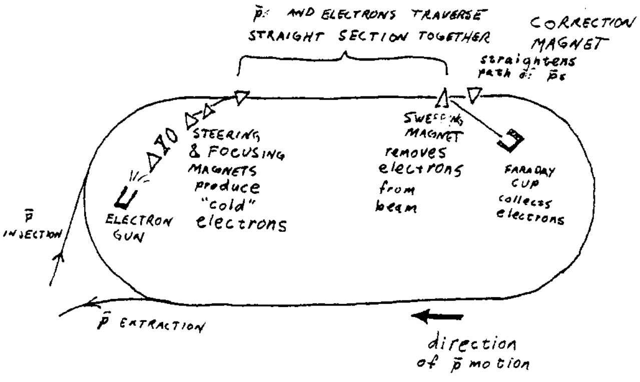

$\bar{p}$s AND ELECTRONS TRAVERSE STRAIGHT SECTION TOGETHER
CORRECTION MAGNET
straightens path of $\bar{p}$s
STEERING & FOCUSING MAGNETS produce "cold" electrons
ELECTRON GUN
SWEEPING MAGNET
removes electrons from beam
FARADAY CUP
collects electrons
$\bar{p}$ INJECTION
$\bar{p}$ EXTRACTION
direction of $\bar{p}$ motion

Figure 3

A Basketball for a Bacillus

At this point the pbars are returned to the Precooler, which accelerates them from 200 MeV to 8 Gev, the minimum energy required by the Main Ring. In a few seconds the Main Ring brings them to 100 GeV and shunts them into the Tevatron, the superconducting ring ring of superconducting magnets which shares the same tunnel.

We have only a few million antiprotons at this point. This is no great quantity; we could have gotten more than this in an ordinary beamline, without all this cooling folderol. But a good synchrotron with an excellent vacuum can keep high-energy particles circulating for many hours or even days. Stashing our new pbars in the Tevatron, we will return to the beginning of the process to manufacture more. It is hoped that five hours' work will produce 10^{11} pbars. They would have the same mass as a drop of water .9 microns across--too small to see, but bite-sized for a bacterium. This tiny amount would be the largest quantity of antimatter ever collected.

I'll leave the fruits of these labors coursing through the Tevatron until next issue. At that time I'll talk about what happens next, and what physicists hope to learn from the antiproton.

* * *

Retraction

HEY FOLKS, I HEAR YOU...and you're right. I got a torrent of mail on The Issue; that is, the business of Jon Singer's letter. I could fill two or three issues, in fact, and that's good; moses, that's what I *want*. I have many reasons for writing, but one *important* reason is to stir the soup a little, and crack the apathy. To that end I admittedly overstate things. But I figure it's better to be noisy and attract your attention and then force you to sift through some hyperbole than to bore you and be ignored right out of the gate.

A three-yards-back glance at the mailpile allows me to take the GT temp about here:

A) Jon Singer was full of crap about the things he said, and

B) I was full of crap for responding the way I did.

On The Issue itself, most writers took my position, though with less than my own particular brand of certitude. What hurt was having them tell me that I ruined my case being snotty. Hurt, yes, but I deserved it.

Let me put it like this: On The Issue itself (separated from the histrionics) I stand firm: We do *not* treat women like shit. Language must *not* be a political battleground. Progress in *anything* takes time.

But...the delivery I retract completely. Sorry, Jon, really; it was uncalled for. Please write again. I'll treat you better.

There's another issue here that troubles me some: The matter of tirades in *PyroTechnics*. Yes, I write them. Sometimes I *regret them* a little. In the case of Jon's letter and my response, I regret them a *lot*.

I feel deeply, and because I feel deeply, I write. I don't know how else to explain the stories that flash in out of nowhere and *demand* to be written, nor the anger that sometimes *flows* out on paper when something I cherish is attacked. It works two ways. I write tirades, but I also wrote "The Tech of Loving" and "Silicon Psalm." Putting feelings into a balanced perspective is one of the most difficult of the crafts of being a writer, and one which I study constantly. But this I know: If I were to choke back on all the anger, I would simultaneously mute the voices that allow me to speak of love and compromise.

So bear with me. If I speak angrily, try to look past it and see if there isn't something underneath it that might be worth attention. And if I seem to be entirely off the mark, don't hesitate to say so. It's the only way I learn.

In general, I'm going to try to back off a little on the vituperation. In return, think *hard* about the things I say: Apathy will only hand *the* world over to the stupid.

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